

# Reproduction in the Short-beaked Echidna, *Tachyglossus aculeatus*: Field Observations at an Elevated Site in South-east Queensland

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As part of a radiotelemetric study of echidnas (*Tachyglossus aculeatus*) in south-east Queensland focussing on thermal relations, we were able to confirm and extend present knowledge of echidna reproduction. Mating was concentrated in July and August, as elsewhere, but we found that echidnas have the ability to conceive successfully a second time within the one season, apparently in response to losing the first young. Echidnas in this area of south-east Queensland may be able to attempt breeding every year. Our data supports published estimates of gestation in the range of 20 to 23 days. Females spent two to three weeks in a plugged 'incubation' burrow, maintaining a high and stable body temperature for a period encompassing the last few days of gestation, all of incubation and the first few days of the hatchling's life. The single young was carried in the female's pouch for 45-50 days, attaining a body weight of approximately 200g before being stowed in a different plugged 'nursery' burrow. We describe the first detailed timing of a female's visits to suckle her young. She visited regularly, every six days at first, gradually increasing in frequency to about every four days before the visits ceased and, presumably, the newly-independent young emerged at a calculated five and a half months of age.

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## INTRODUCTION

Short-beaked echidnas (*Tachyglossus aculeatus*) are extremely cryptic in the wild and rarely breed in captivity. This makes studies of their reproductive biology difficult and piecemeal. Early information was gained from dissection of dead specimens, single opportunistic observations on animals in the wild and sequential observations of females and their young taken into captivity. This identified the breeding season (July-August) and the egg incubation period (10.5 days) and provided a detailed picture of the anatomy and biochemistry of the reproductive organs and lactation (see Griffiths 1968, 1978). However, comprehensive information on life history parameters and behaviours was lacking.

The advent of radiotelemetry made it possible to obtain information about reproduction by echidnas in their natural habitat. However, early telemetric studies concentrated on other aspects of echidna biology such as home range (Augee et al. 1975). Some short-term telemetric studies by Green et al. (1985) and Griffiths et al. (1988)

added information on milk intake by echidna offspring and suckling behaviour of lactating females, as did an observation on a single female echidna by Abensperg-Traun (1989). Long-term radiotelemetry studies of echidnas in the wild began in 1986, focussing on thermal relations (Grigg et al. 1989, 1992) and also providing some of the first longer-term field observations on echidna reproduction (Beard et al. 1992). Shortly thereafter, Rismiller, working on Kangaroo Island off the southern coast of Australia, commenced an extensive long-term study on echidnas in the wild, concentrating on reproduction and behaviour (Rismiller and Seymour 1991; Rismiller 1992, 1999; Rismiller and McKelvey 2000). Further fieldwork which may contribute to knowledge of echidna reproduction is currently underway also in Tasmania (S. Nicol and N. Andersen, University of Tasmania, pers. comm.)

While a number of the questions about echidna breeding have now been answered, there is still uncertainty about many aspects, especially those dependant on direct and/or long term observation. Our continuing radiotelemetric study of echidna thermal relations in south-eastern Queensland has provided an opportunity to make such observations and to compare and contrast them with what is known of echidna reproduction and behaviour in more southern areas of Australia.

## MATERIALS AND METHODS

The study site comprises parts of several grazing properties between Texas and Stanthorpe in SE Queensland at an elevation of 500-1000 metres, centred on 28°41'S, 151°32'E. The area is a mixture of mostly cleared, undulating grazing paddocks with varying grass cover depending on the season, and scrubby, mostly uncleared gullies. Echidnas were captured opportunistically and, with clearance from the University's animal experimentation and ethics committee, were implanted with temperature-sensitive radio transmitters (Austec Enterprises, Canada and Sirtrack Ltd., New Zealand). The transmitters, fitted with an internal loop antenna, were coated in a biologically inert wax mixture ('Elvax' / paraffin wax 20%/80% w/w) and implanted in the peritoneal cavity. They served to locate echidnas by radiotracking as well as to telemeter body temperature. Signals were acquired using a vehicle-mounted omni-directional whip antenna and TR-2 receiver + TS-1 scanner (Telonics, USA) and/or tracked on foot with a hand-held H-antenna (Telonics, USA) and receiver.

One female also had, in two consecutive years, a waterproof, wax-coated temperature-sensitive datalogger ('Tidbit', Onset Corp., USA) implanted in the peritoneal cavity. Combined weight of the transmitter plus datalogger was approximately 50gm in an animal of average weight 3.25 kg. Body temperature data from animals with implanted transmitters could often be recorded automatically using a system which consisted of a timer switching on and off a receiver/scanner and tape recorder at preset intervals (Grigg et al. 1990). The same system could be used to monitor time spent by a female in a burrow, using a low gain antenna, or a feedline alone, placed on the ground above the burrow, so that it would pick up a signal from the female only when she was in the burrow or very close, during entry and exit.

Any condition or activity which may have been related to breeding was noted for each animal during the course of tracking and weighing for other studies. As echidnas are normally solitary, aggregations of more than one animal were assumed to signal possible breeding-related activity. The presence of pouch young was obviously evidence of breeding, while an enlarged, loose pouch was taken to indicate its very recent vacation by a burrow-sized young (Griffiths 1968). Other signs included swollen mammary glands which were obvious when the female's belly was exposed and from which droplets of milk could often be extruded, especially under anaesthetic for transmitter implantation. A swollen cloacal area in males was also taken to indicate some reproductive activity because, in this condition, the penis often partly everted when the animal was handled or

anaesthetised. Normally the penis, when not in use, sits in a fully-enclosed sac off the cloaca.

We inferred dates of successful matings by working backwards from the estimation of the ages of pouch young using growth curves from Griffiths (1978, in litt.) and Green et al. (1985) and/or time in a brooding burrow, assuming an incubation period of 10.5 days (Griffiths 1978) and a gestation period of 20-23 days. We use the term gestation to describe that period between fertilisation and when the egg is laid. Fertilisation was assumed to occur shortly after mating (see Rismiller and McKelvey 2000).

Pouch young were sometimes removed from the pouch for weighing, often with the female anaesthetised lightly with halothane until she relaxed enough for the young to be removed without a struggle, weighed and then replaced. The young were apparently insulated enough by the pouch to escape the effects of the anaesthetic.

## RESULTS

Twenty-one echidnas, from a total of 30 animals (20 males and 10 females) which were captured in the study area over nine years, provided observations related to breeding. Individuals remained in the study population for lengths of time varying from a few months to several years. Those we lost presumably had transmitters fail or emigrated (Table 1).

Table 1. Echidnas included in this study.

Echidna #	Sex	Captured	Lost	BW at capture (kg)	Time followed (months)
52	F	26.4.90	19.1.91	4.45	9
56	M	24.5.90	17.3.91	4.2	10
63	M	12.7.90	7.4.93	3.75	33
65	F	27.7.90	20.2.91	3.8	7
66	M	27.7.90	21.10.90	3.9	3
67	M	2.8.90	19.12.90	3.8	4.5
		23.10.92	11.10.93	4.0	11.5
68	F	6.9.90	22.8.92	2.85	23.5
69	F	11.10.90	11.10.93	2.95	36
77	M	19.6.91	11.10.93	1.45	28
81	M	30.8.91	29.10.92	3.25	14
83	F	28.1.92	21.7.93	3.45	18
84	M	7.9.92	23.7.94	? at capture 4.3 (10.2.92)	22.5
85	F	22.9.92	6.4.93	2.55	6.5
87	M	29.10.92	11.10.93	?	11.5
90	F	20.7.94	present	3.35	54+
91	M	20.7.94	2.9.95	3.8	13.5
92	M	9.7.95	present	5.2	42+
93	F	23.11.95	present	3.7	38+
94	F	30.11.95	present	3.55	38+
95	M	19.3.96	present	4.35	35+
100	M	9.10.96	present	4.4	27+

**Mating and its timing.**

Mating activity in this area is focussed in the second half of July and in August (Fig. 1). However, we saw males keeping company with females for longer than this (Fig. 1), so the potential for mating extends outside this period, as in the case of a female which, in October, replaced an egg lost earlier (see below). This second mating must have occurred on or about 22 October, making it the latest mating yet recorded. If, as we have assumed, a swollen cloaca is a guide, males are available and ready both before and after the season in which most matings are focussed (Fig. 1). Most commonly, mating in this area occurred two to three weeks after emergence from hibernation. However, some females mated within a week of emergence, as was typical in the Kosciusko study (Beard et al. 1992). In one instance we observed a male and female (#52) together less than six days after the female had emerged from hibernation (Fig. 2). Abrasions noticed around the cloaca of the female after this encounter suggested that this was a mating and subsequent observations of the size of the young indicated that it was successful. We have never found more than two males with a female at the same time. Nor did we see evidence of the mating ruts or trenches described on Kangaroo Island (Rismiller and Seymour 1991).

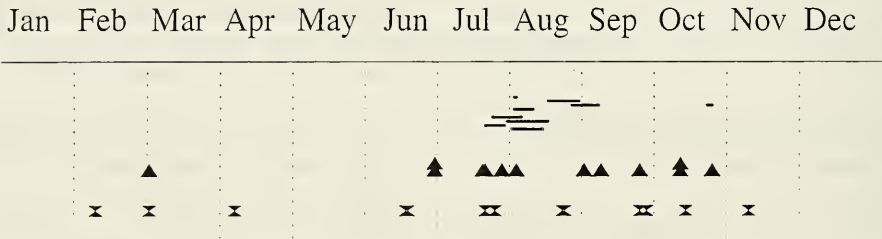


Figure 1. Seasonal occurrence of males being found with an enlarged cloacal area/penis (X), being found with a female (triangle), and times at which successful matings occurred, as inferred from sizes of young and other indirect evidence (bar defines the period in which the mating must have occurred).

**A second breeding event in the same season.**

The observations presented in Fig. 1 which were made in October were parts of a second reproductive event in the same season for the female involved. Echidna #93 was tracked to a plugged burrow on 17 and 18 September (Fig. 2) and when captured on 25 September had the remains of an egg in her pouch, but no young. Subsequently, on 9 October, she was found in a log with two males. One of the males was not a marked animal and so was taken for transmitter implantation. The other was relocated with the same female the next day in a different log pile and found with the same female yet again on our next field trip on 22 October in a rabbit warren. We assume they had been together for the intervening period. The discovery of a 72g young in the female’s pouch on 17 December confirmed that a successful mating had occurred on or about 22 October. If, as reported by Rismiller and McKelvey (2000), eggshell remains in the pouch no longer than 48 hours after hatching, the period between loss of the young and the next mating would have been approximately one month.

**Gestation period.**

The 72g young from #93, referred to above, was estimated to be 25-27 days old, with a hatching date of 20-22 November from an egg laid 10-12 November. Assuming a fixed incubation period of 10.5 days (Griffiths 1978), the gestation period was of the order of 20-23 days. This was our most complete series of observations relating to gestation period.

Another estimate of length of gestation was made, for #90, using data on body temperature (Tb), instead of observations of pairing, to infer the date of mating. Beard et

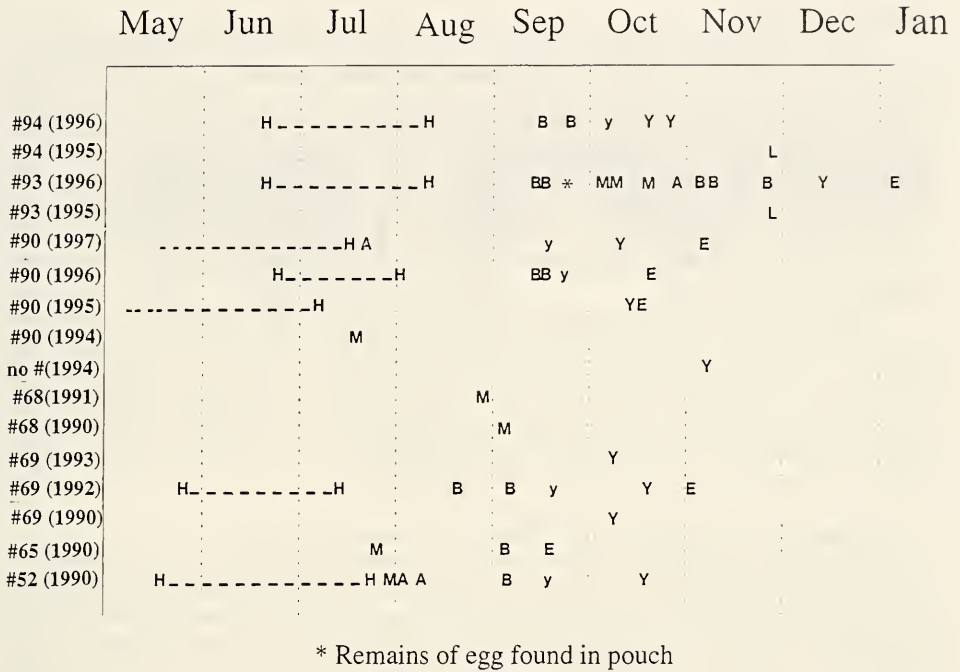


Figure 2. Seasonal occurrence of reproductive events associated with individual females, year by year. H = hibernation, A = active, unaccompanied, M = found with at least one male, B = underground in an incubation burrow or log, y = carrying small pouch young, Y = carrying large pouch young, E = empty pouch, L = lactating.

al. (1992) reported that the body temperatures of paired echidnas in a retreat were higher than those of solitary echidnas in similar retreats and attributed this to the activity associated with mating. #90's temperature record shows a period of approximately 30 hours during which body temperature was maintained essentially stable at around 30°C (Fig. 3). If this coincided with mating, and if laying date is inferred in the same way as for #93, i.e. from estimating the age of young, a gestation period of 21-22 days is deduced.

Another set of observations, less complete, is at least consistent with a 20-23 day gestation period. #52 was found with a male and, as evidenced by cloacal abrasions, assumed to have been mated on 2 August. She was found again on 21 September with a pouch young barely able to be held within the pouch and clearly due to be planted in a nursery burrow. The pouch young was not weighed. A gestation period of 20-23 days would have made this young 47-50 days old, quite consistent with our estimates of the planting of young in a burrow at 45-50 days (see below).

### Pouch life.

Females in this study were found to carry pouch young until 45-50 days after hatching, attaining a weight of approximately 200g, after which they were deposited in a burrow. Young which, from subsequent observations, were just about to be deposited in a burrow, did not yet have erupted spines but were unable to fit wholly within the pouch. The females in these instances were obviously experiencing difficulty keeping their belly area and the young from dragging on the ground and were unable to curl completely into their defensive posture, leaving part of the young's body exposed.

**Incubation burrows.**

As far as we can ascertain, all females occupied an incubation retreat continuously for a period of two to three weeks roughly corresponding to the time just prior to egg-laying, through incubation of the egg and into the first week or so of the hatchling's life. These incubation retreats, usually abandoned rabbit burrows except for one case in which a log was used, were always 'plugged' with a mound of earth, in a similar way to the nursery burrows in which the larger young were later stowed. This was in contrast with overnight shelters or hibernation burrows which were always unplugged. Plugging could be used reliably as an indicator of whether or not an incubating female or, later in the year, a burrow young was in residence as burrows were always left unplugged when the occupant(s) had moved on.

While burrows and other shelters are known to be re-used commonly in this area for overnight and short term retreat (Wilkinson et al. 1998), we have so far seen no sign of burrow re-use for reproduction either in the same year or in subsequent years. Female #90 did not use the same nursery burrow in consecutive years. Another female for which we can be certain (#93), used a different nursery burrow for caching the young from that used for incubation. She also used a different burrow for each of the two incubation periods she spent in the same breeding season.

**Body temperature and behaviour within the incubation burrow.**

During the period spent underground in an incubation burrow, females displayed patterns of body temperature which were uncharacteristically high and stable compared to an echidna's normal heterothermic rhythm during the active season. Readouts from the implanted datalogger in female #90 showed a much reduced daily range corresponding with the period around egg incubation, with body temperatures being maintained relatively stable at 31-32 °C (Fig. 3). Transmitter data recorded automatically from female #93 showed a similar pattern. Although her body temperature varied a bit more, it did not drop below 29-30°C while she was underground in a plugged burrow. This was in contrast to the more typical daily sinusoidal pattern of body temperatures recorded the following month when she was observed to be active and carrying her pouch young. A third female, #94, was tracked on several consecutive occasions over more than a week to a burrow in a rubbish dump. Her body temperature, although not monitored continuously, was higher than 32°C whenever measured during this time. Twelve days later on our next field trip, we found her out of the burrow, with a small pouch young, confirming that she would have been incubating an egg or a very small hatchling during her time in the burrow.

**Visits by the female to the nursery burrow.**

In one case, we were able to continuously monitor maternal visits to a young in the burrow. Female #90 was observed still carrying the young on 16 October. Three days later, on 19 October, she was tracked to a plugged burrow which was subsequently confirmed as a nursery burrow when our automatic data recording system monitored repeated visits by the female. The first two visits lasted approximately 24 and 17 hours respectively and were separated by three days. Thereafter, the female visited at remarkably regular intervals, starting about six days apart until early December and gradually increasing frequency to every five then every four days until the burrow was no longer visited after 13 February. In contrast to the longer visits in the first few days, none of these subsequent visits exceeded five or six hours and most were around three to four hours with a tendency towards even shorter visits of two to three hours in the second half of the young's burrow life. When compared to the normal spread of body temperatures for this female at this time of year, her body temperatures while visiting the nursery burrow were consistently in the higher 'active' range, above 30°C. The visits happened most often during the pre-dawn to mid morning hours, after the female's usual active period, although they were not restricted to these times.

Unfortunately equipment failure prevented us from determining the exact end of

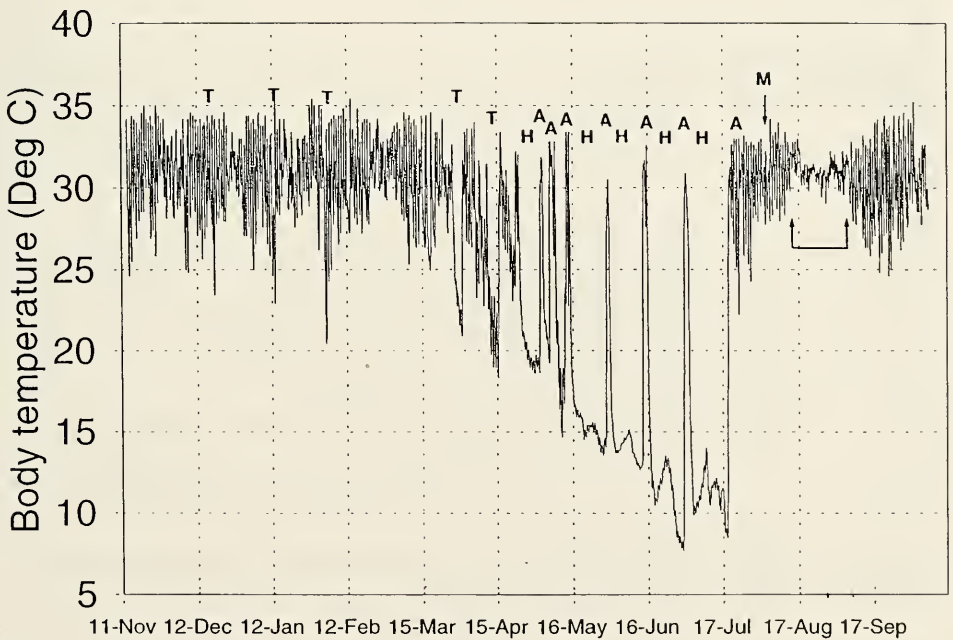
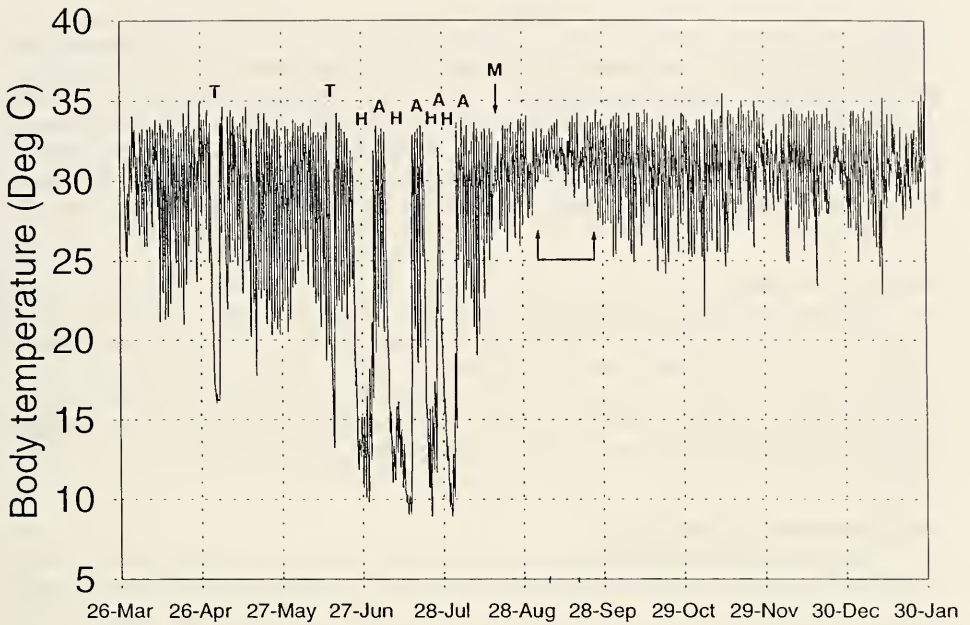


Figure 3. Body temperatures sampled hourly using an implanted data logger for two 11 month periods, from March 1996 to November 1996 (above) and November 1996 - October 1997 (below) for female echidna #90, showing the heterothermy associated with the active seasons, two winter hibernation seasons and, particularly, the reduced heterothermy associated with mating (single arrow, M) and with incubation (joined pair of arrows). T = torpor, H = hibernation, A = arousal.

burrow life, but we know it was between 29 January and 13 February. That the burrow had been vacated was confirmed by it being left unplugged coinciding with the automatic readings showing no more visits by the female, and the appearance of another possible exit hole. These observations indicate that the young spent about three and a half to four months in the burrow, which would make it approximately five to five and a half months old at independence. As we did not excavate the burrow, because we were interested to see whether the female would reuse it the following year, it is possible that the young died or was killed prior to emergence. The female did become pregnant again the next year but did not re-use that burrow.

### Breeding frequency.

Every female that we followed for more than one breeding season showed at least some evidence of breeding-related activity in consecutive years (Table 2), although we do not know whether they were successful in conceiving and rearing young to independence in all cases. Sudden weight gains exhibited by a couple of animals some time after depositing their young in a nursery burrow may indicate loss of their suckling because, as Rismiller (1999) also observed, female echidnas maintained or slightly increased weight once their young were deposited in a burrow.

### Sexual maturity and body size.

We found evidence that growth continues past sexual maturity. Female #90, which exhibited breeding activity in three consecutive years, continued to grow throughout that time, at approximately 4.8 mm/year, while her weight varied up and down between 3.0 kg and 4.05 kg. This supports Rismiller and McKelvey's (2000) opinion that size and/or weight is probably not a good indicator of maturity.

Table 2. Evidence of breeding in consecutive years

Echidna #	Year	Details
68	1990	Attracted male follower, 6/90
	1991	Attracted male follower, 8/91
69	1990	160g pouch young died during first capture
	1991	no young-hibernated until 21/9
	1992	Young reared successfully at least to burrow age-nfi *
90	1993	Young reared successfully until death of mother just prior to burrow age
	1994	Initially captured in company of a male, July-nfi
	1995	Young apparently successfully reared until independence in Feb 96
	1996	Young reared successfully until at least 40 days-nfi
	1997	Young reared successfully at least to 145g (38-40 d?)-nfi
	1998	Attracted male follower, no young observed
93	1995	Lactating when captured in Nov., tracked to suspected nursery burrow-nfi
	1996	1 <sup>st</sup> pregnancy lost young at egg stage 2 <sup>nd</sup> pregnancy young reared successfully at least to 72g and probably to burrow age
	1997	Found with male 9/97
94	1998	Found with male- subsequently suspected young in burrow but not sighted
	1995	Lactating when captured in Nov.
	1996	Young reared successfully at least to 110g
	1997	Found <2m from male 9/97

\* nfi = no further information



## DISCUSSION

The most significant observation reported here is the second breeding event by a female in the same season. It was apparently stimulated by the loss of an earlier young. Rismiller and Seymour (1991) noted that it was unknown whether a female who has lost her egg or pouch young early in the breeding season could breed again. Our single unequivocal observation shows that they can, but how commonly remains unknown. A report of an egg seen on 22 October (Griffiths 1978) may be another, hitherto unrecognised example of the same thing. This phenomenon may be more likely to occur in Queensland than in cooler parts of Australia because of the longer time available for young to develop and for the female to regain condition before the onset of a comparatively shorter, milder winter. The one month period observed between loss of the first hatchling and the second mating may be relevant to interpretation of future data on echidna oestrous cycles.

Our study, although reporting observations from one animal only, has provided the most complete picture so far of maternal care following caching of the young in a burrow. Griffiths et al. (1988) documented suckling visits at intervals of five to ten days by one female, using disturbance of sticks placed across the burrow entrance as a guide. However, their observations started only when the young was approximately 150 days old. Abensperg-Traun (1989) also made a few observations on one animal, with the shortest noted interval between visits being three days immediately following the caching of the young in the burrow. Rismiller and McKelvey (2000) reported suckling for two hours every five to six days, although there is no information provided on the number of observations or the age of the young.

The young probably goes torpid at least some of the time between feeding visits by the mother, as observed in one instance by Griffiths et al. (1988). The female may need to warm up her infant before feeding, which is consistent with the higher 'active' body temperatures observed for the mother during feeding visits. Indeed, it is not yet known at what stage the burrow young acquires the ability to thermoregulate. Also noteworthy was the relatively short length of each visit. Echidnas are known to have a prodigious ability to imbibe large amounts of milk in a very short time (Green et al. 1985; Griffiths 1989) and from a young age. Green et al. and Griffiths reported that even young in the pouch go three to four days without feeding. The results presented here are entirely consistent with this picture.

Another significant observation reported here is the further confirmation of tighter body temperature ( $T_b$ ) regulation by the female while underground around the time of egg incubation, first described for females in the Kosciusko area (Beard et al. 1992) and confirmed by Nicol and Andersen (2000) in Tasmania. It seems likely that the higher  $T_b$  of females in an incubation burrow may be associated with muscular activity. Frequently, when animals were tracked to 'plugged' incubation burrows, the signal strength was variable, which would usually be taken as an indication of movement (Grigg et al. 1992). As these incubating females were obviously not going anywhere, there is a strong possibility that they were moving or shivering to generate the heat required to maintain the higher and more stable than normal body temperatures observed.

This tighter body temperature regulation around the time of incubation is in contrast to the typical echidna heterothermic pattern which was observed during most of gestation, but the significance of this is unclear. Perhaps a constant, warmer temperature at this stage is necessary to maintain development. It is hard to see, however, why there is a premium on temperature regulation during incubation of the egg and not throughout gestation. Clearly, further work is needed.

The breeding season in our study area is broadly similar to that found in other places in Australia (Griffiths 1989; Beard et al. 1992; Abensperg-Traun 1989). As emergence from hibernation presumably sets the earliest date for production of young, minor variation in the timing of breeding may be related to regional differences in temporal hibernation patterns.

Our estimates of gestation period agree well with Rismiller and McKelvey's (2000) estimate of 22 to 24 days. It should be noted, however, that there is no reason to suppose that the timing of these events is as fixed as typical data from more homeothermic endotherms. Fig. 3 shows how variable a female echidna's body temperature can be during the gestation period. They may even become torpid, as reported by Geiser and Seymour (1989). Assuming developmental rate is temperature dependant, this pronounced heterothermy may help to explain why there have been such variable estimates reported, including 9-27 days (Griffiths, 1989), 18-27 days (Rismiller 1992), 22-24 days (Rismiller and McKelvey 2000), 19-28 days (Knee 1998) and 20-23 days in this study.

The carriage of young in the pouch, reported here, has been noted on Kangaroo Island, around Canberra and in Western Australia. However, in the Kosciusko area we saw no young being carried (Beard et al. 1992). Presumably they were left in the burrow once the female started foraging again after the birth, so this feature of reproductive behaviour may vary geographically.

Our estimate in south-east Queensland of 45-50 days carriage in the pouch before young are deposited in a nursery burrow is similar to the average of 53 days given by Griffith (1989), the estimate of 50-55 days quoted by Abensperg-Traun (1989) and the range 45-55 days given by Rismiller and McKelvey (2000). It is likely that the end of pouch life is dictated by the young reaching a size which is too big for the female to carry comfortably and safely.

We found that the young weighed about 200g when deposited in a nursery burrow, in agreement with the lower end of Rismiller and McKelvey's (2000) observed body weights of 180-260g. Griffiths (1978) observed young still being carried in the pouch at 260g. This difference could be a consequence of Queensland echidnas being generally smaller than those in some southern mainland areas and having correspondingly smaller young. Green et al.'s (1985) data suggest that, after they reach 90g, growth rate of the young echidna is proportional to the mother's weight. Rismiller and McKelvey (2000) also supported the speculation that smaller young are produced by smaller mothers and that the size of the mother may also influence time to weaning. This may help explain why our estimate of age at weaning, 5-5 1/2 months, is somewhat younger than the 6-7 months reported by Rismiller and McKelvey (2000) and suggested by Griffiths et al.'s (1988) observations. The smallest breeding female we encountered weighed 2.9 kg just after her young hatched.

The use of plugged incubation burrows has been reported in other studies. Abensperg-Traun (1989), working in the Western Australian wheatbelt, recorded an unbroken period of at least eight days spent underground by a female echidna about the time of incubation and hatching of her young. Rismiller (1992) and Rismiller and McKelvey (2000) observed the use of an underground retreat by females for up to ten days during egg incubation on Kangaroo Island, but noted that it is facultative, with many females being found out foraging during this time. In contrast, our work in Australia's Snowy Mountains described an unbroken period of four to six weeks coinciding with egg incubation and the first three weeks or more of the hatchling's life, with the young never being observed in the female's pouch. This pattern has also been reported for Tasmania (Knee 1998). The practice of 'plugging' or back-filling nursery burrows for older offspring, which seems to be a feature of all areas, may serve to discourage predation or, as suggested by Griffiths et al. (1988), to maintain 'equable' conditions within the burrow.

Several of our observations are in contrast to studies on Kangaroo Island (Rismiller and Seymour 1991; Rismiller 1992) and may be related to differing echidna densities. Rismiller and McKelvey (2000) recorded approximately nine animals per hectare, which is almost certainly higher than many other places in Australia, and certainly higher than in our study area. Males on Kangaroo Island generally follow females for longer periods (up to seven weeks) before mating occurs, often forming 'trains' of up to 11 animals. Our mating aggregations apparently occurred for shorter periods and involved fewer animals, which may reflect decreased competition due to lower densities. The lack of mating ruts

or trenches in this study area may also be related to density, or to the different substrate (hard, stony ground) which characterises much of it.

The possibility that breeding could occur at times of the year other than the assumed breeding season should not be overlooked, because we found males with bulging cloacas prior to winter on three occasions (Fig. 1), one of them in the same log as a female.

How often individual echidnas breed remains an open question. Griffiths (1989) stated that echidnas do not breed every year, based on proportions of lactating females in a study on Kangaroo Island in late spring. Rismiller and McKelvey (2000) reported variable periods (average four to six years) between breeding events for female echidnas on Kangaroo Island, with only one animal breeding in three consecutive years, associated with the premature death of young in the first two years. Beard et al. (1992) observed two instances of breeding activity in consecutive years in the Kosciusko area but these were also associated with the premature death of the previous year's young. Our observations indicate that female echidnas in this study area of SE Queensland have the capacity to attempt to breed every year and also point to a possible ability to rear young successfully to weaning in consecutive years.

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